

Claims:

1. A hybrid vehicle, comprising:

an internal combustion engine;

5 an electric power-mechanical power input output

mechanism that is connected to an output shaft of the internal combustion engine and to a drive shaft linked with one axle of said hybrid vehicle and inputs and outputs power from and to the output shaft and the drive shaft through input and output

10 of electric power and mechanical power;

a motor that inputs and outputs power from and to either of the one axle and the other axle, which is different from the one axle;

an accumulator unit that transmits electric power to and
15 from the electric power-mechanical power input output mechanism and the motor;

a drive power demand setting module that sets a drive power demand required for a drive of said hybrid vehicle;

a vehicle speed measurement module that measures vehicle
20 speed of said hybrid vehicle;

a lower rotation speed limit setting module that sets a lower rotation speed limit, which represents a minimum allowable rotation speed of the internal combustion engine, corresponding to the measured vehicle speed; and

25 a control module that controls the internal combustion engine, the electric power-mechanical power input output

mechanism, and the motor to drive the internal combustion engine at a rotation speed of not lower than the set lower rotation speed limit and to drive said hybrid vehicle with a power corresponding to the set drive power demand.

5

2. A hybrid vehicle in accordance with claim 1, said hybrid vehicle further comprising:

a rotation speed demand setting module that sets a rotation speed demand, at which the internal combustion engine is to be driven, corresponding to the set drive power demand, wherein said control module controls the internal combustion engine, the electric power-mechanical power input output mechanism, and the motor to drive the internal combustion engine at a higher rotation speed between the set lower rotation speed limit and the set rotation speed demand.

3. A hybrid vehicle in accordance with claim 2, wherein said rotation speed demand setting module sets the rotation speed demand to a specific rotation speed of the internal combustion engine that ensures efficient output of the power corresponding to the set drive power demand from the internal combustion engine.

4. A hybrid vehicle in accordance with claim 1, wherein said lower rotation speed limit setting module sets the lower rotation speed limit to a rotation speed of not lower than a

specific rotation speed of the internal combustion engine at a specific drive point that ensures efficient output of a required power from the internal combustion engine for a constant-speed drive of said hybrid vehicle on substantially
5 flat road surface at the measured vehicle speed.

5. A hybrid vehicle in accordance with claim 1, wherein said control module controls the internal combustion engine, the electric power-mechanical power input output mechanism, and
10 the motor to stop fuel injection to the internal combustion engine, when the set drive power demand is equivalent to a predetermined braking power for braking said hybrid vehicle.

6. A hybrid vehicle in accordance with claim 1, wherein
15 the electric power-mechanical power input output mechanism comprises:

a three shaft-type power input output module that is linked to three shafts, that is, the output shaft of the internal combustion engine, the drive shaft, and a rotating shaft, and
20 automatically determines power input from and output to a residual one shaft based on powers input from and output to any two shafts among the three shafts; and

a generator that inputs and outputs power from and to the rotating shaft.

25

7. A hybrid vehicle in accordance with claim 1, wherein

the electric power-mechanical power input output mechanism comprises a pair-rotor motor that has a first rotor connected to the output shaft of the internal combustion engine and a second rotor connected to the drive shaft and is driven through
5 relative rotation of the first rotor to the second rotor.

8. A power output apparatus that outputs power to a drive shaft, said power output apparatus comprising:

an internal combustion engine;

10 an electric power-mechanical power input output mechanism that is connected to an output shaft of the internal combustion engine and to the drive shaft and inputs and outputs power from and to the output shaft and the drive shaft through input and output of electric power and mechanical power;

15 a motor that inputs and outputs power from and to the drive shaft;

an accumulator unit that transmits electric power to and from the electric power-mechanical power input output mechanism and the motor;

20 a power demand setting module that sets a power demand required for the drive shaft;

a rotation speed measurement module that measures rotation speed of the drive shaft;

a lower rotation speed limit setting module that sets a
25 lower rotation speed limit, which represents a minimum allowable rotation speed of the internal combustion engine,

corresponding to the measured rotation speed; and

a control module that controls the internal combustion engine, the electric power-mechanical power input output mechanism, and the motor to drive the internal combustion engine
5 at a rotation speed of not lower than the set lower rotation speed limit and to output a power corresponding to the set power demand to the drive shaft.

9. A control method of a hybrid vehicle, said hybrid
10 vehicle comprising: an internal combustion engine; an electric power-mechanical power input output mechanism that is connected to an output shaft of the internal combustion engine and to a drive shaft linked with one axle of said hybrid vehicle and inputs and outputs power from and to the output shaft and the
15 drive shaft through input and output of electric power and mechanical power; a motor that inputs and outputs power from and to either of the one axle and the other axle, which is different from the one axle; and an accumulator unit that transmits electric power to and from the electric
20 power-mechanical power input output mechanism and the motor,

said control method comprising the steps of:

(a) setting a drive power demand required for a drive of said hybrid vehicle;

(b) setting a lower rotation speed limit, which
25 represents a minimum allowable rotation speed of the internal combustion engine, corresponding to a measured vehicle speed;

and

(c) controlling the internal combustion engine, the electric power-mechanical power input output mechanism, and the motor to drive the internal combustion engine at a rotation
5 speed of not lower than the set lower rotation speed limit and to drive said hybrid vehicle with a power corresponding to the set drive power demand.